Government investment in manufacturing

Stimulus or hindrance to Pakistan's private sector?

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Abstract *The cornerstone of the government's adjustment program is to increase the efficiency of private investment and activity by deregulating the economy and promoting competition. The counterpart of this fundamental strategy is the need to increase the effectiveness of the public sector which in Pakistan had become overextended. To this end, public sector resources and management capacity are being redirected and concentrated in those areas in which public sector intervention is required because of market failures or social objectives. The results obtained strongly suggest that the government's program is supported by strong empirical evidence. There is no question that private investment has been discouraged by the public capital formation in manufacturing. Not only has government investment in this area stifled the private sector, but also it has diverted funds away from productive activities that would most likely have encouraged a follow-on expansion in private investment.*

Introduction

The sources of growth in any country can be examined from several different perspectives, each suggestive of policy actions undertaken by government authorities:

(1) The factors of production – the relative contribution of labor capital and the like to overall output.

(2) The major sources of output demand – consumption, investment, exports.

(3) Sectoral contribution to growth – the contribution to output made by agriculture, manufacturing, etc.

Regarding the sectoral contributions to growth in Pakistan, Burney (1986) found that over the 1960-85 period, commodity producing sectors (agriculture and manufacturing) accounted for than 40 percent of the growth in GDP. The major crops were the main source of the varying contribution of agriculture. In the case of manufacturing, large-scale sectors' output accounted for more than 60 percent of the contribution.

The economy has gone through a number of major changes since 1985. In particular (but especially from 1988 onwards) progress has been particularly strong in the area of freeing the private sector from regulation and artificial price distortions. In addition, a complementary privatization program was launched with the aim to reduce the role of the public sector in manufacturing and services, thereby alleviating the government's financial and administrative burden and creating new opportunities for the private sector.

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For the government's strategy to work it must be shown that increased private investment in manufacturing elicits a follow-on expansion in private investment in other key sectors. It must also be shown that the process of diverting investment from government manufacturing enterprises to other activities will increase the overall efficiency of public funds in stimulating follow-on private investment.

The purpose of this paper is to explore these issues. Has the expansion of private investment in manufacturing increased the profitability of investment in other key sectors of the economy? And, if so, in which areas? Has government investment in manufacturing produced similar effects? Would a diversion of public investment funds from manufacturing to areas supporting private investment (energy, infrastructure) stimulate greater amounts of private investment and if so in which sectors?

Patterns of investment

A brief examination of recent trends in investment is useful to put several of these issues into perspective. The major categories of investment have undergone considerable change sine the early 1970s. In particular:

(1) Total government investment (Table I) accounted for around 43 percent of national investment in 1973. Under the first Bhutto administration this quickly reached 63 percent in 1976, only to fall gradually since that time. During the 1980-87 period the government accounted for nearly 55 percent of the country's capital formation. By 1988-92 its average was slightly under 50 percent.

(2) The decline in the role of government investment is even more stark when looking at its contribution to the growth in national investment. During the 1980-87 period of the national investment growth of 6.25 percent, 2.86 percent was contributed by the public sector. While the growth of national investment was more or less constant into the 1988-92 period (6.22 percent), the public sector only contributed 0.89 percent.

(3) Similar patterns are reflected in the public's sector's investment in semi-public enterprises (Table II). In addition to manufacturing these enterprises include the Indus Basin, Electricity and Gas, Agriculture and some service activities. For the period as a whole (1973-92) government investment in these enterprises accounted for slightly over 30 percent of national investment. Again this reached a peak in the mid-1970s with investment in this area averaging 33.44 percent for the decade as a whole. Since then, investment has declined to 31.13 percent over the 1980-82 period and 26.38 for the period of macroeconomic stabilization and structural adjustment. From an average growth of 18.33 percent, investment in these activities declined to slightly under 3 percent for the 1988-92 period.

(4) Even more dramatic shifts have occurred with regard to public investment in manufacturing (Table III). During the 1970s public capital formation was particularly active in this area, with the share of national investment accounted for by these activities reaching 18.88 percent in 1978 (up from 1.17 percent in 1973. During the 1970s investment in these firms increased

at an average rate of slightly over 75 percent. With average rates of investment declining by 13.01 percent during the 1980-87 period, the share of total investment going into public enterprises averaged around 2 percent in the 1988-92 period.

(5) Public investment in energy is another area that has experienced great volatility. However, this has been an area of general expansion rather than the contraction experienced in semi-public enterprises. While the share of energy investment averaged about 10 percent for the 1973-92 period as a whole, the average in 1988-92 was well over 14 percent. This is in sharp contrast to an average of 8.71 percent during the 1970s.

Year	Growth in total investment	Government investment			
		Value	Share	Growth	Contribution
1973	–3.39	14.16	42.94	5.77	2.26
1974	6.79	19.46	55.27	37.44	16.08
1975	21.23	25.21	59.07	29.56	16.34
1976	22.42	32.91	63.00	30.57	18.06
1977	5.84	34.35	62.12	4.36	2.75
1978	0.60	33.91	60.96	–1.29	–0.80
1979	3.21	34.96	60.89	3.11	1.89
1980	12.04	37.93	58.95	8.48	5.16
1981	–2.17	34.43	54.71	–9.22	–5.43
1982	4.63	37.70	57.26	9.51	5.20
1983	7.56	40.14	56.67	6.46	3.70
1984	2.11	39.49	54.60	–1.62	–0.92
1985	7.75	42.09	54.01	6.57	3.59
1986	8.76	46.07	54.36	9.46	5.11
1987	9.30	51.57	55.67	11.94	6.49
1988	1.54	50.29	53.47	–2.47	–1.37
1989	10.19	53.70	51.82	6.78	3.62
1990	4.52	52.31	48.29	–2.59	–1.34
1991	6.88	55.65	48.07	6.38	3.08
1992	7.98	56.17	44.93	0.93	0.45
AV 72-92	6.89	–	54.85	8.01	4.20
AV 73-79	8.10	–	57.75	15.65	8.08
AV 80-92	6.24	–	53.29	3.89	2.10
AV 80-87	6.25	–	55.78	5.20	2.86
AV 88-92	6.22	–	49.32	1.81	0.89
VA 72-92	40.09	–	28.94	132.93	36.08
VA 73-79	85.19	–	41.99	222.86	58.73
VA 80-92	14.44	–	14.97	36.15	11.37
VA 80-87	17.96	–	2.60	43.83	14.16
VA 88-92	8.81	–	9.07	16.80	4.52

Note:
Value in millions of 1985 rupees;
AV = average;
VA = variance.
Computed from World Bank data. Contribution to the growth in total national investment is computed by weighing total government investment growth rate by the previous year's share of total investment.

Table I.
Pakistan: contribution of total government investment to total national investment, 1973-1992

Year	Growth in total investment	Government investment Value	Share	Growth	Contribution
1973	–3.39	6.56	19.89	–17.83	–4.17
1974	6.79	9.92	28.19	51.35	10.21
1975	21.23	13.83	32.40	39.36	11.09
1976	22.42	20.49	39.21	48.15	15.60
1977	5.84	20.36	36.81	–0.64	–0.25
1978	0.60	21.87	39.31	7.42	2.73
1979	3.21	21.98	38.28	0.52	0.20
1980	12.04	25.46	39.58	15.83	6.06
1981	–2.17	19.73	31.35	–22.50	–8.91
1982	4.63	19.54	29.67	–0.98	–0.31
1983	7.56	21.99	31.05	12.54	3.72
1984	2.11	21.54	29.78	–2.05	–0.64
1985	7.75	22.64	29.06	5.12	–1.52
1986	8.76	24.58	29.00	8.55	2.48
1987	9.30	27.37	29.05	11.36	3.29
1988	1.54	26.14	27.79	–4.49	–1.33
1989	10.19	30.76	29.68	17.66	4.91
1990	4.52	27.93	25.78	–9.20	–2.73
1991	6.88	27.63	23.87	–1.05	–0.27
1992	7.98	30.95	24.76	12.01	2.87
AV 72-92	6.89	–	30.75	8.56	2.31
AV 73-79	8.10	–	33.44	18.33	5.06
AV 80-92	6.24	–	29.30	3.29	0.82
AV 80-87	6.25	–	31.13	3.48	0.90
AV 88-92	6.22	–	26.38	2.98	0.69
VA 72-92	40.09	–	28.57	356.16	29.04
VA 73-79	85.19	–	44.99	646.49	45.21
VA 80-92	14.44	–	13.72	120.66	14.04
VA 80-87	17.96	–	10.84	131.33	17.90
VA 88-92	8.81	–	4.43	103.43	7.84

Table II.
Pakistan: contribution of government investment in semi-public organizations to total national investment, 1973-1992

Note:
Value in millions of 1985 rupees;
AV = average;
VA = variance.
Computed from World Bank data. Contribution to the growth in total national investment is computed by weighing the government investment in manufacturing growth rate by the previous year's share of total investment.

(6) In contrast to the other main areas of pubic investment, general government investment (including federal, provincial and local) has remained fairly stable at around 20 percent of national investment. On the other hand, some deceleration has taken place in recent years. During the 1988-92 period capital formation (largely infrastructure) by these organizations expanded on average at only 0.57 percent. This is in sharp contrast to the 7.87 percent average of the 1980-87 period and the 16.63 average growth achieved in the 1970s.

(7) In general, private investment has been considerably more stable (measured by the average variance) than public capital formation. Its share in total

Year	Growth in total investment	Government investment Value	Share	Growth	Contribution
1973	–3.39	0.39	1.17	–2.97	–0.03
1974	6.79	1.08	3.08	180.96	2.12
1975	21.23	2.46	5.77	127.36	3.92
1976	22.42	6.56	12.56	166.49	9.60
1977	5.84	8.41	15.20	28.14	3.53
1978	0.60	10.50	18.88	24.93	3.79
1979	3.21	10.79	18.80	2.77	0.52
1980	12.04	9.67	15.03	–10.43	–1.96
1981	–2.17	6.38	10.14	–34.01	–5.11
1982	4.63	5.71	8.66	–10.56	–1.07
1983	7.56	5.90	8.33	3.39	0.29
1984	2.11	5.96	8.24	0.97	0.08
1985	7.75	3.87	4.97	–35.01	–2.88
1986	8.76	4.47	5.28	15.59	0.77
1987	9.30	2.95	3.19	–33.99	–1.79
1988	1.54	2.59	2.76	–12.23	–0.39
1989	10.19	2.04	1.97	–21.27	–0.59
1990	4.52	1.60	1.48	–21.44	–0.42
1991	6.88	1.81	1.56	12.69	0.19
1992	7.98	2.80	2.24	54.72	0.85
AV 72-92	6.89	–	7.46	21.80	0.57
AV 73-79	8.10	–	10.78	75.38	3.35
AV 80-92	6.24	–	5.68	–7.04	–0.93
AV 80-87	6.25	–	7.98	–13.01	–1.46
AV 88-92	6.22	–	2.00	2.49	–0.07
VA 72-92	40.09	–	32.6	3841.75	8.81
VA 73-79	85.19	–	47.1	5476.68	8.66
VA 80-92	14.44	–	15.8	583.43	2.59
VA 80-87	17.96	–	11.8	332.47	3.28
VA 88-92	8.81	–	0.2	837.11	0.28

Note:
Value in millions of 1985 rupees;
AV = average;
VA = variance.
Computed from World Bank data. Contribution to the growth in total national investment is computed by weighing the government investment in manufacturing growth rate by the previous year's share of total investment.

Table III.
Pakistan: contribution of government investment in manufacturing to total national investment, 1973-1992

capital formation has gradually risen since the mid-1970s to the point where during the 1988-92 period it averaged slightly over 50 percent for the first time. As might be expected growth was lowest in the 1970s (1.63 percent). It is encouraging that the highest rate of expansion (10.94 percent) in private investment has been in the 1988-92 period of reform and adjustment.

(8) The expansion in private investment in manufacturing has been particularly strong since 1980, averaging well over 19 percent per annum through 1992.

(9) As a result of this surge in capital formation in large scale manufacturing, these activities accounted for nearly 22 percent of national investment in

1992. The comparable figures for 1980 and 1973 were 5.25 and 8.5 percent respectively. Perhaps more importantly, as a result of its increased share of total investment, private investment in large scale manufacturing accounted for about one half (3.15 of a total of 6.22) of the growth in total national investment during the 1988-92 period.

(10) Investment in small scale manufacturing has been somewhat more stable than that in larger scale enterprises. This stability has resulted in capital formation in these firms averaging around 2.5 percent for each of the major sub-periods examined. However, it is encouraging that during the 1988-92 period, investment grew at nearly 12 percent in this area (up from an average of 7.19 percent for the period as a whole).

Patterns of causal impact

These patterns are of interest in and of themselves. However, for policy purposes one needs to go a step further and examine the direction (and magnitude) of impact investment in manufacturing has had on capital formation in the other major areas of economic activity. Clearly, if it can be shown that increases in private sector investment in manufacturing encourage and promote an expansion of private sector investment in other areas of the economy (and public investment in manufacturing does not) then the case for privatization in manufacturing is very strong. Other patterns would provide much less support for the government's program.

The original and most widely used causality test was developed by Granger (1969, 1980, 1986, 1988). According to this test, increased manufacturing investment causes (say) growth in investment in the construction sector, if rates of expansion in investment in the construction sector can be predicted more accurately by past values of manufacturing investment than by past rates of growth of investment in construction. To be certain that causality runs from manufacturing to construction, past values of manufacturing must also be more accurate than past values of construction in predicting the observed rates of growth in manufacturing investment over time.

Granger test

More formally, Granger (1969) defines causality such that X Granger causes (G-C) Y if Y can be predicted more accurately in the sense of mean square error, with the use of past values of X than without using past X. Based on the definition of Granger causality, a simply bivariate autoregressive (AR) model for manufacturing investment and that of investment in the non-manufacturing sector can be specified as follows:

$$SEC(t) = c + \sum_{i=1}^{p} a(i)SEC(t-i) + \sum_{j=1}^{q} b(j)MAN(t-j) + u(t) \quad (1)$$

$$MAN(t) = c + \sum_{i=1}^{r} d(i)MAN(t-1) + \sum_{j=1}^{s} e(j)SEC(t-j) + v(t) \quad (2)$$

where *SEC* is the growth in non-manufacturing sectoral investment and *MAN* = the growth in real manufacturing investment.; *p*, *q*, *r* and *s* are lag lengths for each variable in the equation; and *u* and *v* are serially uncorrelated white noise residuals. Assuming that error terms (*u*, *v*) are "nice" ordinary least squares (OLS) becomes the appropriate estimation method.

If the disturbances of the model were serially correlated, the OLS estimates would be inefficient, although still unbiased, and would distort the causal relations. The existence of serial correlation was checked by using a maximum likelihood correlation for the first-order autocorrelation of the residuals [AR(1)]. The comparison of both OLS and AR(1) results indicated that no significant changes appeared in causal directions. Therefore, we can conclude "roughly" that serial correlation was not serious in this model.

Within the framework of unrestricted and restricted models, a joint F-test is appropriate for causal detection:

$$F = \frac{(RSS(r) - RSS(u)/(df(r) - df(u)}{RSS(u)/df(u)} \tag{3}$$

where *RSS*(*r*) and *RSS*(*u*) are the residual sum of squares of restricted and unrestricted models, respectively; and *df*(*r*) and *df*(*u*) are, respectively, the degrees of freedom in restricted and unrestricted models.

The Granger test detects causal directions in the following manner: first, unidirectional causality from *MAN* to *SEC* if the F-test rejects the null hypothesis that past values of *MAN* in equation (1) are insignificantly different from zero and if the F-test cannot reject the null hypothesis that past values of *SEC* in equation (2) are insignificantly different from zero. That is, *SEC* causes *MAN* but *MAN* does not cause *MAN*. Unidirectional causality runs from *SEC* to *MAN* if the reverse is true. Second, bi-directional causality runs between *MAN* and *SEC* if both F-test statistics reject the null hypotheses in equations (1) and (2). Finally, no causality exists between *MAN* and *SEC* if we cannot reject both null hypotheses at the conventional significance level.

The results of Granger causality tests depend critically on the choice of lag length. If the chosen lag length is less than the true lag length, the omission of relevant lags can cause bias. If the chosen lag is greater than the true lag length, the inclusion of irrelevant lags causes estimates to be inefficient. While it is possible to choose lag lengths based on preliminary partial autocorrelation methods, there is no a priori reason to assume lag lengths equal for all types of economic activity.

The Hsaio procedure

To overcome the difficulties noted above, Hsaio (1981) developed a systematic method for assigning lags. This method combines Granger Causality and Akaike's final prediction error (FPE), the (asymptotic) mean square prediction error, to determine the optimum lag for each variable. In a paper examining the problems encountered in choosing lag lengths, Thornton and Batten (1985) found Hsiao's method to be superior to both arbitrary lag length selection and several other systematic procedures for determining lag length.

The first step in Hsiao's procedure is to perform a series of autoregressive regressions on the dependent variable. In the first regression, the dependent variable has a lag of one. This increases by one in each succeeding regression. Here, we estimate M regressions of the form:

$$G(t) = a + \sum_{i=1}^{m} b(t-1)\ G(t-1) + e(i) \tag{4}$$

where the values of m range from 1 to M. For each regression, we compute the FPE in the following manner:

$$FPE(m) = \frac{T+m+1}{T-m-1}\ ESS(m)/T \tag{5}$$

where T is the sample size, and $FPE(m)$ and $ESS(m)$ are the final prediction error and the sum of squared errors, respectively. The optimal lag length, m^*, is the lag length which produces the lowest FPE. Having determined m^*, additional regressions expand the equation with the lags on the other variable added sequentially in the same manner used to determine m^*. Thus we estimate four regressions of the form:

$$GT(t) = a + \sum_{i=1}^{m^*} b(t-1)\ G(t-1) + \sum_{i=1}^{n} c(t-1)D(t-1) + e(i) \tag{6}$$

with n ranging from 1 to 4. Computing the final prediction error for each regression as:

$$FPE(m^*,n) = \frac{T+m^*+\ n+1}{T-m^*-n-1} ESS(m^*,n)/T$$

we choose the optimal lag length for D, n^* as the lag length which produces the lowest FPE. Using the final prediction error to determine lag length is equivalent to using a series of F-tests with variable levels of significance. Since the F statistic is redundant in this instance they are not reported here. They are, however, available from the authors on request.

The first term measures the estimation error and the second term measures the modeling error. The FPE criterion has a certain optimality property that "balances the risk due to bias when a lower order is selected and the risk due to increases in the variance when a higher order is selected" (Hsiao, 1979). As noted by Judge *et al.* (1982), an intuitive reason for using the FPE criterion is that longer lags increase the first term but decrease the RSS of the second term, and thus the two opposing forces are optimally balanced when their product reaches its minimum.

Depending on the value of the final prediction errors, four cases are possible: (a) Manufacturing Investment causes Non-Manufacturing Sectoral Investment when the prediction error for non-manufacturing decreases when manufacturing is included in the growth equation. In addition, when non-manufacturing investment is added to the manufacturing equation, the final prediction error should increase; (b) Non-Manufacturing Investment causes Manufacturing Investment when the prediction error for non-manufacturing increases when manufacturing is added to the regression equation for non-manufacturing, and is reduced when non-

manufacturing is added to the regression equation for manufacturing; (c) Feedback occurs when the final prediction error decreases when manufacturing is added to the sectoral output equation, and the final prediction error decreases when non-manufacturing output is added to the manufacturing equation; and (d) No Relationship exists when the final prediction error increases both when manufacturing is added to the non-manufacturing investment equation and when non-manufacturing output is added to the manufacturing equation.

Operational procedures

The data for manufacturing and non-manufacturing investment used to carry out the causation tests were derived from various International Monetary Fund (IMF, 1996a) and World Bank reports (IBRD, 1984, 1991, 1992, 1993). These series were deflated by the GDP price deflator (IMF, 1996) and differenced to achieve stationarity (McCallum, 1993) prices. To determine if the results were sensitive to the definition of manufacturing, both small and large scale firms were included in the analysis. Relationships between manufacturing and other areas of the economy were considered valid if they were statistically significant at the 95 percent level of confidence. That is, if 95 percent of the time we could conclude that they had not occurred by pure chance, we considered them statistically significant.

As noted above, there is no theoretical reason to believe that manufacturing investment and investment in all other sectors have a set lag relationship – that is they impact on one another over a fixed time period. The period could be rather short-run involving largely the spin-off from construction or longer-term as either term expands from the stimulus provided by the other. To find the optimal adjustment period of impact, lag structures of up to four years were estimated. The lag structure with the highest level of statistical significance was the one chosen to depict best the relationship under consideration (the optimal lag reported in Tables IV and V).

Again the main questions of interest are: has the expansion in manufacturing initiated an overall expansion in other key sectors of the economy? And if so which areas? Has this pattern changed over time? Here again we are especially interested in examining the impact of the post-1988 reform program.

Because of the need to include as many observations as possible in each causality test, three regressions tests were made for each sector: (1) for the entire time period (1974-1992), (2) the pre-reform years 1974-1988, and (3) the inclusion of the pre-reform years (1978-82). We concluded that the reforms had an impact on the relationship between sector output and overall economic activity if the results in (3) above were significantly different than those reported for the years covered in (2).

Results

Several[1] interesting patterns (Table IV) occur between the individual sectors and investment in private sector investment in manufacturing:

(1) The pattern between private investment in large scale manufacturing and that in agriculture has changed somewhat over time. For the period as a whole (1973-1992) manufacturing has a positive feedback relationship with

Sector	Director of causation	Optimal lag	Impact	Relative strength
Agricultural investment				
Large-scale manuf				
1973-1992	Feedback	4,4	+,+	w,w
1973-1988	Feedback	4,4	+,+	m,w
1977-1992	Manuf→Ag	1	+	m
Small-scale manuf				
1973-1992	Manuf→Ag	1	+	w
1973-1988	Manuf→Ag	3	+	m
1977-1992	Manuf→Ag	1	+	w
Investment in mining				
Large-scale manuf				
1973-1992	Manuf→Mining	2	+	m
1973-1988	Manuf→Mining	4	+	w
1977-1992	Feedback	4,3	+,+	m,m
Small-scale manuf				
1973-1992	Manuf→Mining	1	+	w
1973-1988	Manuf→Mining	2	+	w
1977-1992	Feedback	4,2	+,+	m,m
Investment in construction				
Large-scale manuf				
1973-1992	Manuf→Const	1	+	m
1973-1988	Manuf→Const	3	+	w
1977-1992	Manuf→Const	1	+	s
Small-scale manuf				
1973-1992	Feedback	4,2	–,+	w,w
1973-1988	Feedback	4,2	–,+	w,w
1977-1992	Feedback	4,2	–,+	w,w
Transport investment				
Large-scale manuf				
1973-1992	Manuf→Trans	3	+	w
1973-1988	Manuf→Trans	3	+	w
1977-1992	Feedback	3,4	+,+	m,w
Small-scale manuf				
1973-1992	Feedback	1,1	+,+	m,m
1973-1988	Feedback	1,1	+,+	w,w
1977-1992	Feedback	1,3	+,+	s,w
Investment in services				
Large-scale manuf				
1973-1992	Feedback	4,4	+,+	w,w
1973-1988	Feedback	4,1	+,+	s,w
1977-1992	Feedback	3,4	+,+	w,m
Small-scale manuf				
1973-1992	Manuf→Serv	1	+	m
1973-1988	Manuf→Serv	2	+	w
1977-1992	Feedback	2,1	+,+	m,w

(*continued*)

Table IV.
Pakistan: private investment in manufacturing/sectoral investment causality patterns, 1973-1993

Sector	Director of causation	Optimal lag	Impact	Relative strength
Investment in other services				
Large-scale manuf				
1973-1992	Feedback	3,3	+,+	w,m
1973-1988	Feedback	3,3	+,+	w,w
1977-1992	No relationship	–	–	–
Small-scale manuf				
1973-1992	Feedback	4,2	2,1	w,s
1973-1988	Manuf→OS	2	+	w
1977-1992	Feedback	4,2	+,+	w,m

Note:
See text for description of the computational method. In the case of feedback, the first term refers to the impact from sector investment → manufacturing investment. The second term depicts the relationship from manufacturing investment → sector investment. All variables are defined as natural logarithms. Strength assessment based on size of the regression coefficient(s) and the improvement in r^2. Strength measures: w = weak, m = moderate, s = strong.

Table IV.

agriculture. Here increases in each over a four-year period would increase profitable opportunities in the other. The same pattern existed in the earlier 1973-88 period, but here the impact of private investment in agriculture provided a stronger stimulus to investment in manufacturing than vice versa. Finally in the 1977-92 period the direction of causation has evolved to the point whereby it was largely from manufacturing to agriculture.

(2) The patterns between small scale manufacturing were fairly straightforward with investment in manufacturing encouraging a follow-on expansion in capital formation in agriculture. However, this pattern may have weakened somewhat with time, with the impact stronger in the 1973-88 period than that from 1977 to 1992.

(3) Private investment in mining was also encouraged by expanded private capital formation in private manufacturing activities. This pattern was fairly similar for both small and large scale manufacturing, with the impact greater in the case of large scale manufacturing. In more recent years the pattern seems to have evolved into one of feedback with private investment in manufacturing encouraging investment in mining (after a two or three year lag). In return private investment in mining stimulates (after a four year lag) a further expansion in capital formation in manufacturing. In both instances the impacts are fairly strong. These patterns suggest (and are only suggestive) that manufacturing is becoming more integrated with indigenous mining interests, perhaps resorting to domestic supplies rather than imports.

(4) Private investment in large-scale manufacturing has a direct and positive impact on private investment in construction. This impact occurs after a fairly short interval (usually a year) and has strengthened over time.

(5) The patterns between private investment in small-scale manufacturing and private investment in construction are more complex. While a feedback relationship occurs, the links from construction to manufacturing are negative (while those from manufacturing to construction are positive). One possible explanation lies in the fact that the generally higher (than in small scale manufacturing) rates of growth in private investment in large scale manufacturing set off a construction boom which in turn diverts resources from small scale investment.

(6) Investment in the transport sector has also been made more profitable by private investment in investment in manufacturing. The impact from manufacturing to transport has not been very strong, however. Furthermore during more recent times a fairly strong feedback relationship has developed between investment in transport causing a follow-on expansion in private investment in manufacturing. This feedback pattern also characterizes the relationship between small scale manufacturing and transport.

(7) Private investment in large-scale manufacturing and that flowing into services is also characterized by a feedback pattern. Again in recent years manufacturing has produced a impact stronger than in earlier periods.

(8) The category of other services (finance, insurance, wholesale and retail trade and the like) may be too diverse to provide consistent patterns. However, it is safe to say that in general investment in manufacturing has encouraged follow-on investment in these activities.

The general pattern that emerges from this analysis is one whereby private sector investment in manufacturing appears to open up a number of profitable investment opportunities in other key sectors of the economy. This relationship seems to be strengthening over time. Also, there is some evidence that investment in the sectors is becoming more interdependent, with investment in other sectors beginning to feed back more to manufacturing, setting off another round of expanded capital formation in that sector. Manufacturing appears to interact positively with all of the other sectors – there are no reductions in investment in other sectors of the economy during periods of expanded private capital formation in manufacturing.

For a contrast similar tests were performed using public investment in manufacturing. As a basis of comparison similar causal tests were also performed using government investment in energy and general government investment. Again, several interesting patterns were found (Table V). While one could go into great detail, several overriding patterns emerge:

(1) In general the links between public investment in manufacturing and private investment in the other key sectors of the economy are negative. That is expanded public sector capital formation in its manufacturing enterprises has tended to discourage (and even reduce) private sector investment in other sectors of the economy.

(2) While one might argue that this pattern is caused by public investment crowding the private sector out of the country's financial markets, other types of public investment do not appear to produce this result. In general

both general government investment and public sector investment in energy encourage follow-on investment by the private sector.

(3) Both general government and energy investment experience a number of feedback patterns. They respond to the needs of the private sector and in turn their expansion causes a follow on increase in private sector capital formation.

Sector	Director of causation	Optimal lag	Impact	Relative strength
Agricultural investment				
Government investment manuf				
1973-1992	Feedback	1,4	–,–	w,w
1973-1988	Feedback	1,4	–,–	m,w
1977-1992	Manuf→Ag	4	(–)	w
General government invest				
1973-1992	Feedback	3,3	+,+	w,m
1973-1988	Feedback	3.3	+,+	w,m
1977-1992	Feedback	3,2	+,+	w,s
Government investment in energy				
1973-1992	Feedback	2,1	+,+	w,m
1973-1988	Feedback	2,1	+,+	w,w
1977-1992	Feedback	2,4	+,+	w,m
Mining investment				
Government investment manuf				
1973-1992	Feedback	4,4	+,–	w,w
1973-1988	Manuf→Mining	1	(–)	w
1977-1992	Feedback	3,2	+,–	w,m
General government invest				
1973-1992	Govt→Mining	1	+	m
1973-1988	Feedback	1,1	+,+	w,w
1977-1992	Feedback	3,4	+,+	w,s
Government investment in energy				
1973-1992	Mining→Energy	1	+	m
1973-1988	Mining→Energy	1	+	m
1977-1992	Energy→Mining	2	+	m
Construction investment				
Government investment manuf				
1973-1992	Manuf→Const	1	(–)	w
1973-1988	Const→Manuf	1	(–)	m
1977-1992	Feedback	1,2	–,–	w,w
General government invest				
1973-1992	Govt→Const	1	+	m
1973-1988	Feedback	4,1	+,+	w,m
1977-1992	Feedback	2,1	+,+	w,w
Government investment in energy				
1973-1992	Feedback	4,1	+,+	m,w
1973-1988	Const→Energy	4	+	m
1977-1992	Feedback	1,1	+,+	w,w

(*continued*)

Table V. Pakistan: government investment/private sectoral investment causality patterns, 1973-1993

Sector	Director of causation	Optimal lag	Impact	Relative strength
Transport investment				
Government investment manuf				
1973-1992	Feedback	4	(–)	w
1973-1988	Manuf→Mining	1	(–)	w
1977-1992	Feedback	4	(–)	m
General government invest				
1973-1992	Feedback	3,4	+,+	w,w
1973-1988	Feedback	4,4	+,+	w,w
1977-1992	Feedback	4,4	+,+	w,w
Government investment in energy				
1973-1992	Feedback	1,4	+,+	w,m
1973-1988	Feedback	1,4	+,+	w,m
1977-1992	Energy→Trans	2	+	m
Service investment				
Government investment manuf				
1973-1992	Manuf→Serv	1	(–)	w
1973-1988	Manuf→Serv	1	(–)	w
1977-1992	Manuf→Serv	4	(–)	m
General government invest				
1973-1992	Feedback	4,1	+,+	w,w
1973-1988	Feedback	4,3	+,+	w,w
1977-1992	Feedback	3,4	+,+	w,w
Government investment in energy				
1973-1992	Feedback	1,4	+,+	w,m
1973-1988	Feedback	1,4	+,+	w,m
1977-1992	Feedback	1,4	+,+	w,w
Other service investment				
Government investment manuf				
1973-1992	Manuf→Serv	4	(–)	m
1973-1988	Manuf→Serv	2	(–)	s
1977-1992	No relationship	—	—	—
General government invest				
1973-1992	Feedback	2,1	–,+	w,m
1973-1988	Serv→Govt	2	(–)	w
1977-1992	Feedback	3,4	–,+	s,w
Government investment in energy				
1973-1992	Feedback	4,4	+,+	w,m
1973-1988	Feedback	1,4	+,+	w,w
1977-1992	Feedback	1,3	+,+	w,w

Note:
See text for description of the computational method. In the case of feedback, the first term refers to the impact from private sector investment → government investment. The second term depicts the relationship from government investment → private sector investment. All variables are defined as natural logarithms. Strength assessment based on size of the regression coefficient(s) and the improvement in r^2. Strength measures: w = weak, m = moderate, s = strong.

Table V.

Conclusions

The cornerstone of the Government's adjustment program is to increase the level and efficiency of private investment and activity by deregulating the economy and promoting competition. The counterpart of this fundamental strategy is the need to increase the effectiveness of the public sector which in Pakistan had become overextended. To this end, public sector resources and management capacity are being redirected and concentrated in those areas in which public sector intervention is required because of market failures or social objectives.

The results obtained above strongly suggest that the government's program is supported by strong empirical evidence. There is no question that private investment has been discouraged by the public capital formation in manufacturing. Not only has government investment in this area stifled the private sector, but it has diverted funds away from productive activities that would in all likelihood have encouraged a follow-on expansion in private investment.

For these reasons, it is imperative that the government pursue its privatization program. Progress to date has been encouraging (Table VI).

By November 1992, 67 units had been sold, i.e. a letter of intent had been issued. Of these 67 units, the management of 47 units has been transferred to the private sector on receipt of at least 14 percent of the sales price. The new owners are required to pay at least an additional 26 percent of the sales price within 30 days of the date management is transferred, and the remaining 60 percent balance must be paid within three years (with a 14 percent p.a. mark-up).

While these results represent a considerable achievement, the Government needs to decide how to proceed further. To complete the privatization process of the 105 units, the Government may have to adjust the sales prices or liquidate certain units. For most of the remaining units no bids at the set reserve price were received. It may be necessary to remove the reserve price and simply sell to the highest bidder.

	Number of units				Value of units sold (Rs mill)	
	Total	For sale	Sold	Manag transfer	Total	Received
Commercial banks	5	4	2	2	5,122	2,135
Industrial units	124	105	67	47	8,219	3,896
Autos	15	10	8	5	1,043	583
Cement	15	15	11	8	4,658	2,253
Chemicals	14	12	5	5	1,030	431
Engineering	12	9	4	4	141	58
Fertilizer	7	5	2	1	457	183
Ghee/veg oil	23	23	15	9	626	250
Roti plants	17	17	13	11	99	60
Rice mills	8	8	7	4	165	78
Miscellaneous	13	6	2	0	0	0
Total	129	109	69	49	13,341	6,031

Source: Ministry of Finance

Table VI.
Pakistan: privatization of state owned enterprises

Many of the entities remaining unsold after removing the reserve price, especially those which never received any bids are candidates for liquidation. Most of these companies were already technically bankrupt when they were put on the list. The Privatization Commission should identify the companies that can be financially restructured and re-auctioned, and those whose assets will have to be sold off, taking the loss-making operation out of the market. The Government also needs to consider how to expand the program to the 60 industrial enterprises not yet targeted for privatization as well as others in the service and infrastructure sectors. Some of these enterprises are fairly large and/or provide key goods and services to the economy.

Note

1. The detailed results (in the form of tables similar to Tables I-III) of this and other types of government and private investment are available from the author on request.

References

Burney, N.A. (1986), "Sources of Pakistan's economic growth", *The Pakistan Development Review*, Vol. XXV No. 4, pp. 573-87.

Granger, C.W.J. (1969), "Investigating causal relations by econometric models and cross-spectral methods", *Econometrica*, Vol. 37, pp. 424-38.

Granger, C.W.J. (1988), "Some recent developments in a concept of causality", *Journal of Econometrics*, Vol. 39, pp. 199-211.

Granger, C.W.L. (1980). "Testing for causality", *Journal of Economic Dynamics and Control*, Vol. 2, pp. 329-52.

Granger, C.W.L. (1986), "Developments in the study of cointegrated economic variables", *Oxford Bulletin of Economics and Statistics*, Vol. 48, pp. 213-28.

Hsiao, C. (1979), "Causality tests in econometrics", *Journal of Economic Dynamics and Control*, Vol. 7, pp. 326-35.

Hsiao, C. (1981), "Autoregressive modeling and money-income causality detection", *Journal of Monetary Economics*, Vol. 6, pp. 85-106.

IBRD (1984), *Pakistan: Review of the Sixth Five-Year Plan*, The World Bank, Washington.

IBRD (1991), *Pakistan: Current Economic Situation and Prospects*, The World Bank, Washington.

IBRD (1992), *Pakistan: Current Economic Situation and Prospects*, The World Bank, Washington.

IBRD (1993), *Pakistan: Country Memorandum FY93, Progress under the Adjustment Program*, The World Bank, Washington.

IMF (1996a), *International Financial Statistics Yearbook*, International Monetary Fund, Washington.

IMF (1996b), *Pakistan – Recent Economic Developments*, International Monetary Fund, Washington.

Judge, G.G., Griffiths, H., Lutkephol, H. and Lee, T.C. (1982), *Introduction to the Theory and Practice of Econometrics*, John Wiley & Sons, New York, NY.

McCallum, B.T. (1993), "Unit roots in macroeconomic time series: some critical issues", *Federal Reserve Bank of Richmond: Economic Quarterly*, Vol. 79 No. 2, pp. 13-44.

Thornton, D.L. and Batten, D.S. (1985), "Lag-length selection and tests of Granger causality between money and income", *Journal of Money, Credit and Banking*, Vol. 17, pp. 164-78.